January 23 marks Golden Anniversary of bathyscaph Trieste's 'Deep Dive' world record

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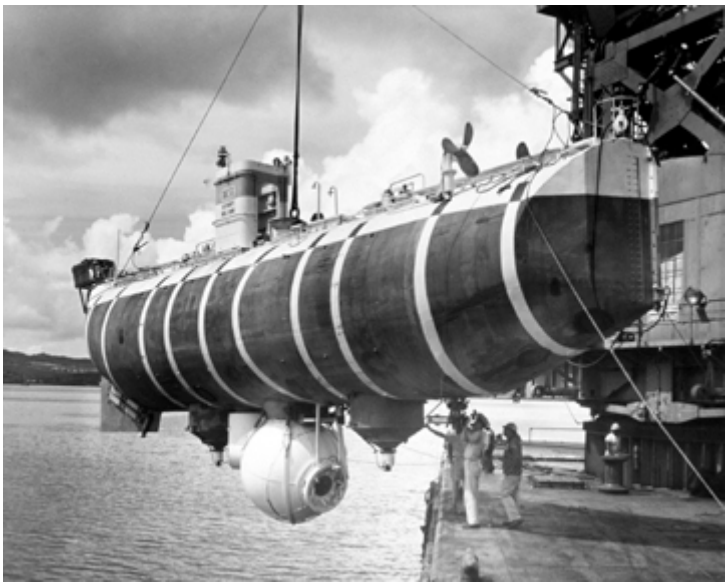
In the annals of science, engineering, and exploration, there are many things that are accomplished once to substantial fame and acclaim for the first individual, for example, discovering a new species of animal, flying a heavier-than-air craft, or climbing Mt. Everest, and then others follow the way. Their achievements are no less noteworthy, just not as timely as "the first."

And there are a few such achievements that are noteworthy because they only occurred once. Such was the "Deep Dive" of the bathyscaph *Trieste* on Jan. 23, 1960, 50 years ago this month. At the time, Trieste, owned by the Office of Naval Research (ONR), was assigned to the SSC Pacific-predecessor U.S. Navy Electronics Laboratory (NEL), which had as one of its principal missions the study of the oceans in which the U.S. Navy had to operate. The bathyscaph was intended to support NEL's extensive oceanographic and sonar research.



Bathyscaph Trieste.

The record dive had no scientific goal, other than to prove the bottom of the oceans could be reached safely and successfully. The men selected for the mission to dive to the deepest known ocean depth were a young U.S. Navy lieutenant named Don Walsh and Jacques Piccard, the son of Auguste Piccard, who had invented and built the bathyscaph.

Mt. Everest provides a a useful comparison that perhaps makes the depth of the dive a little easier to understand. With some variance cited in different accounts between 35,600 and 37,799 feet, it is generally acknowledged that Piccard and Lt. Walsh

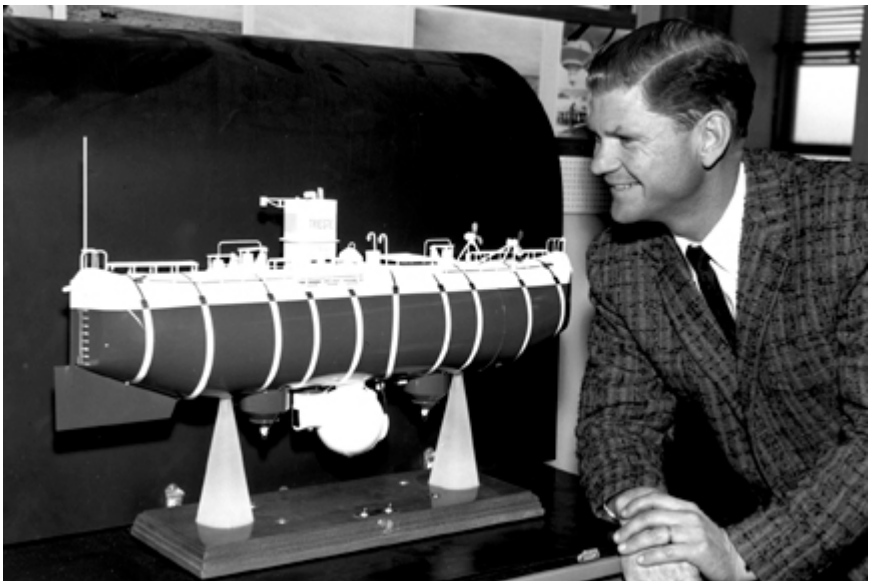
touched the bottom at a water depth of about 35,800 feet, almost seven miles. But the comparison is somewhat staggering. If Mt. Everest, the tallest mountain on Earth, were by some unimaginable act transplanted from the Himalayas and positioned with its base at the bottom of the Challenger Deep in the Mariana Trench, its 29,035-foot summit would still be more than a mile underwater.

Although there have been several unmanned expeditions back to the bottom of the sea, including one recently in which SSC Pacific personnel participated, the Deep Dive maintains its unique record as the only time a human was aboard.

Start of the Challenger Deep Dive that set the world record of 35,800 feet in January 1960, about 200 miles southwest of Guam.

At the time of the record dive, Trieste, which was built in Italy in 1953, had been at NEL less than a year and a half, after a series of dives in the Mediterranean that stimulated ONR to purchase it from its designer. The bathyscaph performed its first dive off San Diego on Dec. 20, 1958, three months after its arrival here.

A year later, Project Nekton was launched, centered on the island of Guam in the far western Pacific. Dr. Andy Rechnitzer, NEL oceanographer, was the project leader. The focus of the six-month project was to establish the bathyscaph's depth limit, with a series of dives made to substantial depths, culminating with the record descent. During that effort, the descent took just under five hours.



Dr. Andy Rechnitzer, the NEL oceanographer who led the Nektron Project, looks at a model of Trieste.

The men spent only 20 minutes on the bottom, but were able to re-establish earlier broken communications and speak to project personnel on the surface through an underwater telephone system. They then began releasing ballast and returned to the surface three hours and 15 minutes later.

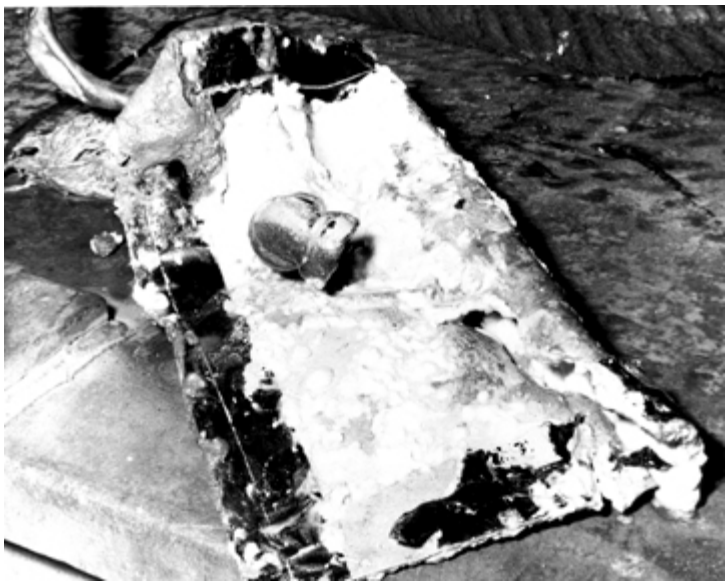
During the nine hours, Piccard and Lt. Walsh spent diving and ascending, they encountered pressure as great as 16,000 psi.

Several weeks later, on Feb. 4, 1960, President Dwight D. Eisenhower presented citations to four members of Project Nekton for their efforts. Dr. Rechnitzer, the project engineer, received the Distinguished Service Award, the highest honorary award for a Navy civilian.

After the record dive, a new project called Nekton II began, also based on Guam. Its mission was to measure sound velocity from the surface to the ocean floor, a task impossible without the bathyscaph platform.

Following Nekton II, Trieste and its crew returned to San Diego, where a major overhaul included almost complete re-building with new parts and the addition of an underwater acoustic telephone, directional gyro-compass, tape recorders, scanning sonar, closed circuit TV, and flood lights.

The tragic loss of the recently commissioned attack submarine USS *Thresher* (SSN 593) in April 1963 led to the urgent transport of *Trieste* aboard USS *Point Defiance* (LSD 31) to the East Coast. The bathyscaph began a series of 10 dives in the suspected loss area off Boston in June 1963 and on August 28 recovered a piece of copper tubing and a fitting that were positively identified as wreckage from *Thresher*.



Thresher debris sighted by Trieste.

On Sept. 5, Secretary of the Navy Fred Korth publicly announced *Trieste* had located the submarine's final resting place in 8,400 feet of water. In October, the seven NEL civilians and 13 military personnel forming the crew of *Trieste* were awarded the Navy Unit Commendation, and Commanding Officer Lt. Cmdr. Don Keach was presented the Navy Commendation Medal.

When *Trieste* returned to San Diego, the platform's value to NEL's research efforts was greatly enhanced by addition of external and internal cameras, plankton samplers, a salinity monitor, temperature probes and automatic water sampling bottles. There was also a capability to mount specialized equipment such as sediment sound velocity probes, current meters and oxygen monitors for the research efforts.

With those capabilities, NEL scientists used the bathyscaph for studies of underwater acoustics, physical oceanography and sea floor studies off the southern California coast. Those included measurement of very low frequency electromagnetic fields as a function of depth, measurement of shear strengths and the acoustic velocity and attenuation of sediments, testing of acoustic transducers at great depths and studies of bottom topography.

In late 1963, the pressure sphere was attached to a new buoyancy chamber (float), and NEL held a "re-dedication" ceremony on Jan, 17, 1964, at which the new vehicle was unveiled. Guest speakers included the Oceanographer of the Navy and the Mayor of San Diego. A plan to re-name the new platform, *Nekton*, was scrubbed because the Navy Unit Commendation awarded for the USS *Thresher* search had by custom to be displayed only on *Trieste*, so the refurbished platform was called *Trieste II*.

Several months later, *Trieste II* was transported to the Atlantic to perform more in-depth study of the USS *Thresher* loss site. A series of deep dives in June, July and August allowed the bathyscaph crew to produce photographs of major components of

the submarine, including the stern planes, the sail and the attached sail plane with hull numbers visible. At one point, according to Officer-in-Charge Lt. Cmdr. J. B. Mooney, at a depth approaching 10,000 feet, *Trieste II* came to rest on a portion of the *Thresher's* hull.

On October 1, the Secretary of the Navy publicly acknowledged the *Trieste II* operations, which ultimately resulted in significant findings about the cause of the loss of Thresher and substantial changes in design of future submarines to prevent such a loss again.

Trieste II returned to San Diego at the end of October 1964, and embarked on a busy schedule of dives off the nearby coast to support NEL oceanographic research. The vehicle was later transferred to Submarine Development Group One at Naval Submarine Base San Diego.

Other laboratory personnel significantly involved for many years in the operation of Trieste and *Trieste II* were Kenneth V. Mackenzie, scientist in charge of the Deep Submergence Program at NEL and a veteran of scores of dives in the platform, including many of the 1963 and 1964 dives on the Thresher loss site, and Giuseppe Buono, an Italian engineer who assisted the Piccards in the construction of the original bathyscaph and continued to serve as the lead engineer for the vehicle for many years.

Trieste was 67 feet long, with a width of 15 feet. The vehicle weighed 53 tons in air, without ballast loaded. Major components of the bathyscaph were the float, the observation sphere, fore and aft water ballast tanks, and forward and aft ballast shot tanks that held 16 tons of steel pellets. In the event of a power failure, the electro-magnets holding the ballast tanks shut also failed, thus opening the valves to dump the shot, allowing a "fail-safe" means of reaching the surface in case of an emergency. The original float was constructed of one-eighth to three-sixteenths inches of steel and was filled with 45,000 gallons of aviation gasoline. The cabin/pressure sphere was fabricated of steel ranging from 3.5 to 5.5 inches thick.

Rather than re-constructing a description of the bathyscaph's operation, here is a quote from the 17 January 1964 issue of the NEL weekly newspaper, *Calendar*, "How TRIESTE Works: In the simplest comparison, a bathyscaph is an underwater balloon. As such, it has the same two major assemblies as the air-balloon: a buoyancy chamber (called the float) and the cabin (called a sphere). Just as the balloon bag is filled with lighter-than-air gas, so the float is filled with a lighter-than-water liquid (aviation gasoline). Like the balloon, the craft is designed to go up and down by releasing ballast and accomplishes these maneuvers by discharging steel ballast, or valving off fluid to make the craft lighter or heavier than its surrounding liquid...Bathyscaph ballast, small 'BB' size steel shot, is carried in two huge tubs. Discharge of the ballast is controlled by an electro-magnetic valve in the orifice of each tub. The sphere is the only significant pressure resistant part of the bathyscaph....The observation window is made of 6-inch thick Plexiglas.